

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1 (currently amended): A method of producing a conjugated diene polymer which comprises polymerizing a conjugated diene compound with a catalyst consisting essentially of the following components (a) to (d) in an organic hydrocarbon solvent; and then reacting with at ~~least one compound selected from the group consisting of the following components (i)~~ component (j) and, optionally, component (i).

Component (a) : a compound containing a rare earth element of atomic number 57-71 in the Periodic Table or a compound obtained by reacting the compound with a Lewis base;

Component (b) : a compound containing at least one halogen atom;

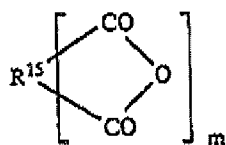
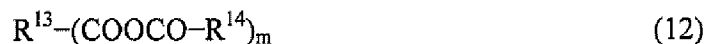
Component (c) : an aluminoxane;

Component (d) : an organoaluminum compound represented by the following general formula (1):



wherein R^1 and R^2 are the same or different and are a hydrocarbon group having a carbon number of 1-10 or a hydrogen atom, and R^3 is a hydrocarbon group having a carbon number of 1-10 provided that R^3 is the same as or different from R^1 or R^2 ;

Component (i) : a carboxylic acid, an acid halide, an ester compound, a carboxylic ester compound or an acid anhydride represented by the following general formula (8), (9), (10), (11), (12) or (13):



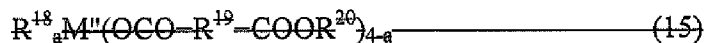
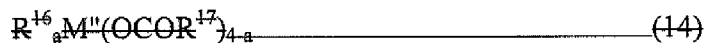
(13)

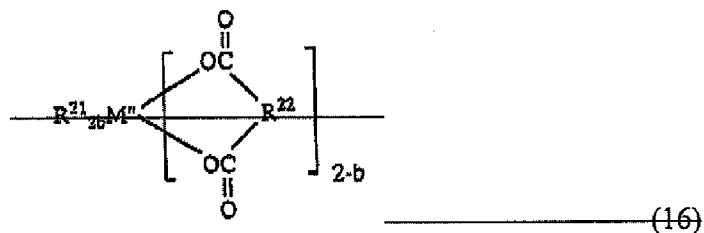
wherein R^7 to R^{15} are the same or different and are a hydrocarbon group having a carbon number of 1-50, X is a halogen atom and m is an integer of 1-5; and

Component (j) : a component selected from the group consisting of dioctyltin dilaurate, dioctyltin bisoctylmaleate, dioctyltin bisbenzylmaleate, dioctyltin bisethylmaleate and bisoctyltin maleate,

wherein the component (j) is used as a modifying agent.

~~a metal salt of a carboxylic acid represented by the following general formula (14), (15) or (16):~~





wherein R^{16} to R^{22} are the same or different and are a hydrocarbon group having a carbon number of 1-20, M'' is a tin atom, a silicon atom or a germanium atom, and a is an integer of 0-3 and b is an integer of 0-1.

2 (original): The method according to claim 1, wherein the resulting polymer after the polymerization with the catalyst has a content of cis-1, 4-bond of not less than 90% and a ratio of weight-average molecular weight to number-average molecular weight of not more than 3.5 as measured by a gel permeation chromatography.

3 (original): The method according to claim 1, wherein the resulting final polymer has a content of cis-1, 4-bond of not less than 90% and a ratio of weight-average molecular weight to number-average molecular weight of not more than 4 as measured by a gel permeation chromatography.

4 (original): The method according to claim 1, wherein the component (a) is selected from the group consisting of a carboxylate, an alkoxide, a β -diketone complex, a phosphate and a phosphite of neodymium, praseodymium, cerium, lanthanum or gadolinium.

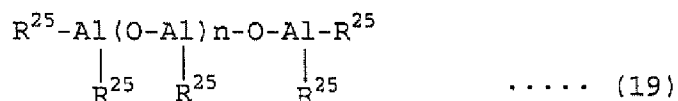
5 (original): The method according to claim 1, wherein the component (b) is selected from a metal halide, an organometallic halide, an organic halide compound and a halogenated silicon compound.

6 (original): The method according to claim 5, wherein said metal halide or organometallic halide is selected from diethylaluminum chloride, ethylaluminum sesquichloride, ethylaluminum dichloride, diethylaluminum bromide, ethylaluminum sesquibromide and ethylaluminum dibromide.

7 (original): The method according to claim 5, wherein said organic halide compound is selected from benzoyl chloride, xylene dichloride, xylene dibromide, propionyl chloride, benzyl chloride, benzylidene chloride, t-butyl chloride and the like; organic bromine compounds such as benzoyl bromide, propionyl bromide, benzyl bromide, benzylidene bromide, t-butyl bromide and the like; methyl chloroformate, methylbromoformate, chlorodiphenyl methane and chlorotriphenyl methane.

8 (original): The method according to claim 5, wherein said halogenated silicon compound is selected from trimethylchlorosilane, methylchlorosilane, diethyl dichlorosilane, methyl trichlorosilane, ethyl trichlorosilane, trichlorosilane, dichlorotetramethyl disilane, dichlorotetramethyl disiloxane and silicon tetrachloride.

9 (previously presented): The method according to claim 1, wherein the component (c) has a chemical structure of the following general formula (19) or (20):



wherein R^{25} is a hydrocarbon group having a carbon number of 1-20, and n is an integer of not less than 2.

10 (previously presented): The method according to claim 9, wherein the hydrocarbon group represented by R^{25} in the formula (19) or (20) is methyl group, ethyl group, propyl group, n-butyl group, isobutyl group or t-butyl group.

11 (original): The method according to claim 1, wherein the component (d) is selected from the group consisting of trimethylaluminum, triethylaluminum, tri-n-propylaluminum, tri-isopropylaluminum, tri-n-butylaluminum, tri-isobutylaluminum, tripentylaluminum, trihexylaluminum, tricyclohexylaluminum, trioctylaluminum, diethylaluminum hydride, di-n-propylaluminum hydride, di-n-butylaluminum hydride, di-isobutylaluminum hydride, ethylaluminum dihydride, n-propylaluminum dihydride and isobutylaluminum dihydride.

12 (original): The method according to claim 1, wherein the component (a) is used in an amount of 0.0001-1.0 mmol per 100 g of the conjugated diene compound and the catalyst has such a composition ratio that a molar ratio of component (a) to component (b) is 1:0.1-1:15, a molar ratio of component (a) to component (c) is 1:1-1:5000, a molar ratio of component (a) to component (d) is 1:1-1:500 and a molar ratio of component (c) to component (d) is 1:0.02-1:300.

13 (original): The method according to claim 1, wherein the conjugated diene compound is selected from the group consisting of 1,3-butadiene, isoprene, 2,3-dimethyl-1,3-butadiene, 1,3-pentadiene, 1,3-hexadiene and cyclo 1,3-hexadiene.

14 (previously presented): The method according to claim 1, wherein an amount of each of the components (i) and (j) used to the component (a) is 0.01-200 as a molar ratio.

15 (canceled).

16 (canceled).

17 (canceled).

18 (canceled).

19 (original): A conjugated diene polymer produced by the method of claim 1 and having a content of cis-1,4-bond of not less than 90% and a ratio of weight-average molecular weight to number-average molecular weight of not more than 4 as measured by a gel permeation chromatography.

20 (canceled).